

Dock Management Strategies in Organic Systems

Why are docks a problem for farmers?

Farmers rate docks as one of the most troublesome of all weeds. They are remarkably resistant to control measures, with high regenerative capacity, due to the large numbers of long-lived seed they produce and the ability to develop from small root fragments. Dock infestations can rapidly build up over a period of 2 or 3 years if they are not managed adequately at which point they can cause significant reduction in yield and quality in grassland and arable crops



Broadleaved dock

There are two main problem species, **broad-leaved dock** (*Rumex obtusifolius*) and **curled dock** (*Rumex crispus*) but hybrids (sometimes called *Rumex pratensis*) are common. There is great variability and adaptability in the species as a whole and docks can colonise a range of sites and habitats



Curled dock

Biology

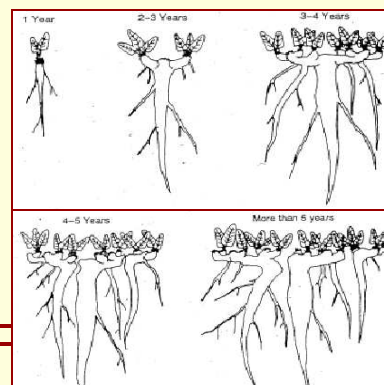
- Both species are perennials that can regenerate from cut underground roots and from seed
- Germination occurs mainly in March-April and September-October, but continues throughout summer if moist
- Broad-leaved docks usually seed in their second year, but curled docks can flower 9 weeks after germination
- They often flower in May-June and again in August-September
- Broad-leaved docks live for at least five years; curled docks may die after flowering if left uncut
- Broad-leaved docks can produce up to 60,000 seeds annually, curled docks less

Seed persistence

- Plants are highly self-fertile
- Seed viable from milk stage onwards (18 days after flowering)
- Viable seeds will develop on flowering stems after cutting
- Seeds persist in undisturbed soil for 50+ years
- Usually a large dock seedbank in farmed land
- Seed will pass through animals and remain viable and therefore can be spread in slurry and manure
- Seed can remain viable in silage clamps, viability is reduced with fermentation aids
- Seed can be carried by wind, on animals, on machinery, and in water
- Long distance seed spread occurs as a contaminant in crop seed, feed, straw and manure

Vegetative spread

- Dock seedlings take 40 days to develop a rootstock capable of developing after cutting
- Roots will readily re-root after cutting or pulling and are able to withstand some degree of desiccation and remain viable
- It is generally agreed that the upper 7.5 cm (3") of broad-leaved and 4 cm (1.5") of curled dock roots are capable of regeneration after cutting



Development of broad-leaved dock over 5 years (from Pino *et al.*, (1995))

What encourages docks?

- Cultivation stimulates germination
- Poaching by animals, producing open sites for germination, especially where stock stand around feeders and water troughs
- Uneven slurry/manure application or grass cutting, again producing sites for invasion
- Inaccessible areas around fences/hedge lines/trees where it is difficult to remove dock plants
- Spreading of dirty water from open sources or slurry from lagoons into which docks have seeded
- Inappropriate or untimely use of machinery can spread established roots
- Bought in and contaminated straw, hay and silage
- Areas of high N and P and low K (although some evidence to say they tolerate high K)

Can they be useful?

- All plants can contribute to a biologically diverse farming system
- Docks can be a good source of minerals for stock e.g. selenium and zinc
- They can help reduce the incidence of bloat (due to high tannin levels)
- The deep rooting system can help to improve soil structure



Seeding dock

How can you prevent docks?

Weed management in an organic system should focus on using as many preventative measures as possible and this is certainly true of docks. Manage docks throughout the rotation. Prevention relies on breaking the cycle of seed production and root establishment. Docks are also not very competitive as seedlings and can be suppressed by well established grass swards and crops. Some general principles are outlined below

In general:

- Manage non cropped areas such as fence lines to prevent docks developing and seeding
- Aerate or ferment slurry to reduce viability of dock seed
- Compost FYM (to achieve sustained temperatures of 50°C or more) before spreading

In grassland:

- Sow a competitive, high tillering, dense and persistent grass sward
- Avoid poaching, particularly due to winter grazing and outdoor feeding
- Stop established plants from seeding by cutting silage leys and/or grazing fields before flowering

In cultivated land:

- Check any sown crop seed is free of dock contamination, have home saved seed cleaned
- Use a weed strike to encourage germination then mechanically kill seedlings before drilling
- Cultivations that are performed when the soil surface temperature is below 15°C should not stimulate dock seed germination
- Avoid peak dock germination periods for sowing crops. Select crop species and varieties that will out compete docks (e.g. prostrate or tall growth habit (triticale) and/or allelopathic effect (rye))
- Undersow leys in cereals and/or use higher crop seed rates
- Grow spring crops which allow greater opportunity for weed control through fallowing and the use of catch crops such as stubble turnips

What are the management options in grassland?

- Tight grazing can help to control docks in grassland. Graze new leys with sheep, which will eat young dock seedlings. Goats will also selectively graze docks. Cattle will graze young dock leaves and shoots up to 21 days old.
- Pigs can be used to uproot docks at the end of the ley phase provided weather and ground conditions allow them to thoroughly root up docks
- Topping, cutting and mowing will cause shooting from ground level and encourage taproot regeneration but prevent seeding. In practice docks have little impact on grass productivity when cut 5-7 times a year, whereas only cutting 3-4 times a year has been observed to reduce productivity
- Topping should be carried whenever flower spikes are produced but before viable seed is set. Start topping as early as conditions permit and continue topping until around mid-September or until viable seed is no longer produced
- Use an off set topper to avoid missing strips where wheels have compacted the vegetation. Flail toppers are more effective than rotary toppers
- Cutting for silage and hay will remove the seed from the field, but may spread the problem when fed to stock later
- Earlier cutting for silage will provide better control than a later cut for hay
- Avoid conserving the same fields year after year
- Top specific patches where problems become evident
- Soil aeration might help to reduce the dock population

An offset topper in use



Machines like the heavy duty Terradisc cultivator may be useful in controlling docks in cultivated land



Rotavating can help to manage mature docks, especially after long term leys

What are the management options in cultivated land?

Management options in cultivated land include both cultural (mainly preventative) programmes and mechanical (mainly curative) techniques. These have been summarised below

Cultural techniques

Cultural techniques aim to prevent docks becoming established and building up through rotations

- If possible sow a competitive dense suppressive crop over winter e.g. grazing rye, forage rape or red clover
- Cut patches or heavy infestations (e.g. for whole crop silage) before docks set seed
- Harvest crops before docks go to seed or take action to top a patch or hand remove
- Graze fields immediately after harvest to prevent docks developing
- Use a fallow period in the summer to deal with docks by regular cultivation (see also below)

Mechanical techniques to control established docks

Mechanical techniques aim to expose and to dry out the dock root in dry weather or to try to exhaust its reserves by repeatedly cutting and encouraging the docks to sprout. There are three approaches:

1. Fallowing with spring tines

- Post harvest or in July prior to autumn sowing of a crop cultivate with heavy duty spring tines, preferably with wide wings to dislodge roots to a depth of at least 15 cm (6")
- Pull roots around with tines to get roots to the surface, and repeat cultivations during any period of dry weather at weekly intervals if conditions are appropriate (dry and windy). In dry conditions a heavy-duty roller can help to break clods and release roots. Some farmers propose using a stone separator with the final webbing removed to get roots to land on the surface after ploughing or cultivating
- Roots should then be harrowed off the field into rows, collected and destroyed (burned), unless complete kill has been achieved by desiccation (in exceptionally dry weather)
- After desiccating and raking off roots, deep plough to bury any remaining trash

2. Fallowing with a plough

- Plough to a depth of 15-20 cm (6-8") during June or early July
- Repeat ploughing 3 or 4 times during summer in dry conditions

3. Fallowing with a rotovator

- Only appropriate in leys that have been established for at least two years (with mature docks in which the dock plant has most sprout points at the crown and near the surface)
- Rotovate ley to a depth of 10 cm (4") in early July (it may need two passes)
- Spring tine regularly (weekly) during dry weather to desiccate crowns
- Plough to a depth of 20 cm (8") prior to final cultivations and drilling in October
- A variation on the rotovator technique is to rotovate at gradually increasing depths e.g. 1.5 cm (0.5"), 3.5 cm (1.5"), 5 cm (2"), 6.5 cm (2.5") and 9 cm (3.5") waiting between operations for docks to re-sprout, the idea being to exhaust the root reserves. Again the final operation is to plough
- In place of a rotovator some success has been achieved with the use of a non-powered Terradisc which has a similar effect but a lower cost

Some farmers and growers find a power harrow is an effective tool for reducing dock populations between crops within a rotation. In all cases hand rogue any light infestations that appear in a field (see below for details)

What can be done by hand?

- Hand removal can be very effective under the right conditions
- Adapted forks, spades and specialist tools are available
- Realistic estimates need to be made of the population. The Lazy Dog Tool company suggest more than 200 per 25 meters squared (270 square feet) should not be tackled by hand
- The same company suggest that work is best carried out outside the growing season when the temperature is cooler and the ground moist
- Organised gangs of 4 or more people, working methodically over a field, give the best results. If possible make 'tramlines' with a tractor and keep between the wheelings to aid the process
- In grassland heel in any large holes made to avoid creating a site for weed invasion
- Allow time to collect and cart docks off the field and consider how they are to be destroyed
- Remember to remove docks in non-cropped areas like fence lines



A manual dock puller

Can biological controls help?

- Possibly as part of a management strategy
- Most promising is the dock beetle *Gastrophysa viridula*, adults and larvae will eat docks
- Adults over winter in the soil (under plants) and emerge in spring to feed on and lay eggs on docks
- Adults can live up to 2 months but normally only for a much shorter period (2-3 weeks)
- The eggs hatch after a week or so and the larvae emerge. The larval period (three stages) lasts up to a month after which they pupate and turn into adults to repeat the cycle
- In some locations in the UK the beetle is able to go through three such cycles in a season depending on temperature and food availability
- We are monitoring to see how to encourage the beetle and if its effects are long lasting
- Other potential biological control options are the rust fungus *Uromyces rumicis* which affects the above ground parts in August-September or leaf spot *Ramularia rubella* purple/red spots which can affect photosynthetic capacity

Defoliation due to beetle larvae



Leaf spot on dock

The information for this leaflet has been produced from a range of sources, including farmers, advisors and researchers, and we gratefully acknowledge their contributions. Most of this information, and further details, are available on our website at <http://www.organicweeds.org.uk>

Would you like to take part in our farmer trials?

- All farmers are experimenting with weed management on their farms, especially ways of managing docks, and we want to collect and share this knowledge
- We also want to add to it by conducting simple trials on a range of different farm types and locations. These trials have been suggested by farmers and are conducted by farmers with two or three treatments
- One trial is investigating 'How long does it take to hand weed docks and how effective is it?' This involves counting two patches of docks, removing one patch (timing how long it takes) and leaving the other. Both patches are then counted several times later. Another trial is simply observing if dock beetle is present on docks and at what time of year.
- The more farmers that take part the more valid the information. All the information will be available on the website either as case histories or as trial results.
- Contact us (see below) or visit the website for more details
- You can also get in touch and tell us what you would like to see researched or get involved with any of the 11 trials which are running at the moment

Disclaimer

The information contained in this leaflet has been compiled from a range of sources. It is accurate to the best of our knowledge. Authors are not responsible for outcomes of any actions taken based on this information.

Project information

This leaflet has been produced as part of the DEFRA funded project 'Participatory Investigation of the Management of Weeds in Organic Production Systems'. The project aims to involve farmers and growers in all levels of research and is driven by their requirements. The project is led by IOR-HDRA in collaboration with IOR-EFRC, Warwick-HRI, ADAS and RULIVSYS. To date the project is funded until July 2006. The project website holds all information gathered on weeds and their management, including literature from science, the farming press and practical strategies from organic farmers. It can be found at:



www.organicweeds.org.uk



How can I get involved?

There are many ways to get involved:

- Send us your name and address and we will add you on to the database so you are kept informed about the project
- Offer to provide information about weed management on your farm, see 'Case studies' on the website
- Become a 'focus group' member (the farmer groups who steer the project direction)
- Take part in the farmer trials and surveys (see above or see website)
- Tell us what you want from the project by attending meetings, open days and joining discussions on the website

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